



National Aeronautics and
Space Administration

Washington, D.C.
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Reply to Attn of:

EL

TO: A/Administrator

FROM: E/Associate Administrator for Space Science and
Applications

SUBJECT: Magellan Post Launch Mission Operation Report

The enclosed Magellan Post Launch Mission Operation Report is
herein submitted as required by HQMI 8610.1B dated December 27,
1982.


L. A. Fisk

Enclosure

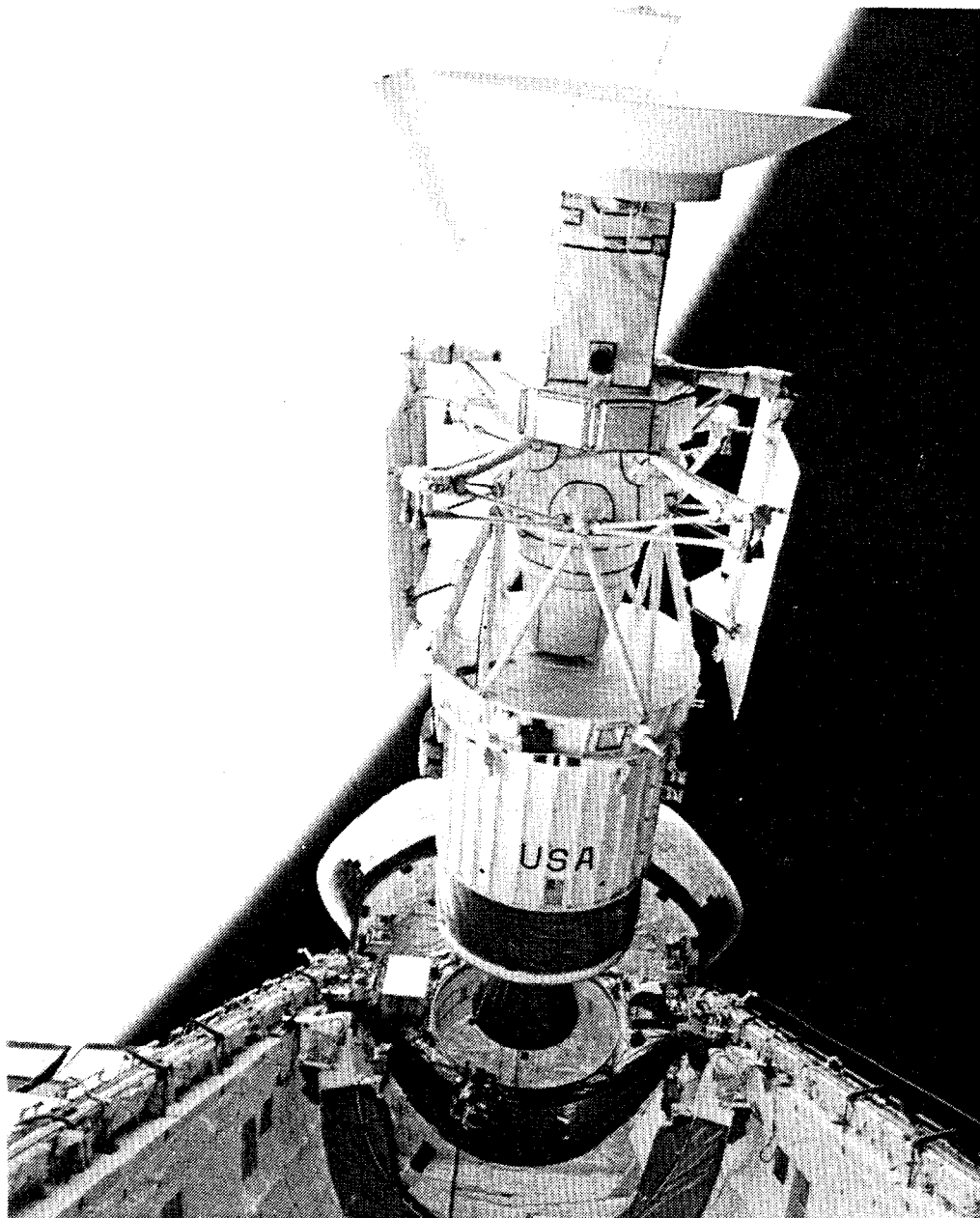


National Aeronautics and
Space Administration

Post-Launch Mission Operation Report

OFFICE OF SPACE SCIENCE AND APPLICATIONS

Report No. E-844-89-30-01



Magellan

The Magellan spacecraft and its IUS booster being deployed from the shuttle Atlantis' cargo bay on May 4, 1989. One hour later, the IUS inserted Magellan onto a 15-month trajectory to Venus.

FOREWARD

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Magellan Post Launch Mission Operations Report
Report No. E-844-89-30-01

Ref: Magellan Mission Operations Report (Prelaunch)
 Report No. E-844-89-30-01, April 13, 1989

Magellan was successfully launched by the Space Shuttle Atlantis from the Kennedy Space Center at 2:47 p.m. EDT on May 4, 1989. The Inertial Upper Stage (IUS) booster and attached Magellan Spacecraft were successfully deployed from Atlantis on Rev. 5 as planned, at 06:14 hrs Mission Elapsed Time (MET). The two IUS propulsion burns which began at 07:14 hrs MET and were completed at 07:22 hrs MET, placed the Magellan Spacecraft almost perfectly on its preplanned trajectory to Venus. The IUS was jettisoned at 07:40 hrs MET and Magellan telemetry was immediately acquired by the Deep Space Network (DSN). A spacecraft trajectory correction maneuver was performed on May 21 and the spacecraft is in the planned standard cruise configuration with all systems operating nominally.

An initial attempt was made to launch Atlantis on April 28, 1989, but the launch was scrubbed at T-31 sec due to a failure of the liquid hydrogen recirculation pump on Space Shuttle Main Engine #1. The countdown had proceeded smoothly until T-20 min when the Magellan radio receiver "locked-on" the MIL 71 Unified S-Band (USB) transmission as the transmitter power was increased from 2 kw to 10 kw in support of the orbiter launch. During the planned hold at T-9 min, the USB was confirmed as the source of the receiver "lock" and Magellan's launch readiness was reaffirmed. In addition a five-minute extension of the T-9 hold occurred when a range safety computer went off-line, creating a loss of redundancy in the range safety computer network. Following resumption of the countdown, both the orbiter and Magellan flows proceeded smoothly until the launch was scrubbed at T-31 sec.

While the orbiter was being readied for another launch attempt, the receiver lock anomaly was thoroughly investigated and changes negotiated to the nominal launch support plan. Specifically, MIL 71 would delay the time when it went to high power until T-11 minutes and would also shift its frequency lower in an attempt to avoid Magellan receiver lock-up.

On May 4, the launch was scheduled at 1:48 p.m. EDT but was delayed 59 min due to unacceptable cloud cover and excessive crosswinds at the Shuttle Landing Facility (SLF) Return-to-Launch-Site runway. Weather conditions were declared acceptable

for launch at 2:42 p.m. EDT and Atlantis was successfully launched at 2:47 p.m. EDT with 5 min remaining in the launch window. The Magellan receiver lock anomaly did not reappear during the countdown.

Atlantis compensated for the delay in launch time by yaw-steering into the correct orbit plane. On-orbit events proceeded smoothly with the deployment and subsequent IUS propulsive burns occurring as scheduled. The performance of the IUS was as predicted and placed the Magellan Spacecraft well within the one-sigma predicted aim point dispersion area. The Magellan solar panels were deployed prior to the IUS burns and were confirmed to be "latched" at initial DSN telemetry acquisition following IUS/Magellan separation.

The Magellan Spacecraft, operating in its nominal cruise condition, proceeded with its initial cruise activities. The first Momentum Wheel desaturation was successfully accomplished at 8:30 p.m. EDT on May 5, 1989. These desaturation events are now nominally occurring twice daily. The first Star Tracker calibration was attempted on May 5, 1989 but was unsuccessful due to improperly adjusted star magnitude thresholds. New star thresholds were subsequently uplinked to the spacecraft and the second Star Tracker calibration was successfully performed on May 6, 1989. Successful Star Tracker calibrations are now conducted daily.

Slight overheating of the Rocket Engine Module (REM's) and the Solid Rocket Motor (SRM) has been observed when the spacecraft attitude is such that the sun shines directly into the thruster nozzles. This overheating is not present when the spacecraft attitude is changed. Test data indicate that both the REM's and the SRM will experience elevated temperatures when the High Gain Antenna is pointed toward Earth for the Very Long Baseline Interferometry (VLBI) tracking this summer, but the temperatures should remain within limits. Thereafter, the spacecraft attitude will not be conducive to REM and SRM overheating during the rest of cruise and the nominal mapping mission.

Due to the near perfect injection by the IUS, the initial Magellan Trajectory Correction Maneuver (TCM-1) required a velocity change of only 2.97 m/s. The maneuver was successfully executed on May 21, 1989 and was within 1.1% of the planned velocity change. Two more TCM's are planned next year to precisely adjust the trajectory for VOI. However, the two TCMs are predicted to require less than 2.0 m/s in total velocity change. At the present time 71 kg of hydrazine margin is available out of a total useable propellant mass of 130 kg, more than enough to successfully complete the Magellan mission. Other cruise activities have been successfully completed as planned, the most recent being the arming of the SRM which is used to place Magellan in Venus orbit. This SRM arming removes the last remaining Shuttle inhibit.

In summary, Magellan is cruising normally on its way to Venus. All spacecraft subsystems are performing well. Figure 1 indicates the major spacecraft cruise activities which are planned between now and VOI.

William L. Piotrowski 6/30/89

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FIGURE 1, SIGNIFICANT MAGELLAN CRUISE EVENTS

LAUNCH	MAY 4, 1989
PLAYBACK OF RECORDED LAUNCH DATA	MAY 12, 1989
OPEN PYRO VALUE	MAY 14, 1989
TCM-1	MAY 21, 1989
ARM SRM	JUNE 5, 1989
BEGIN VLBI	JUNE 28, 1989
GYRO CALIBRATION	JULY 10, 1989
POINT MGA TO EARTH	SEPTEMBER 8, 1989
TEST RADAR SYSTEM	NOVEMBER, 1989
TURN ON TWTA	APRIL, 1990
TCM-2	APRIL, 1990
TCM-3	JULY, 1990
VOI	AUGUST, 1990